A RE-SURVEY OF MIGRANT WATERFOWL USE OF THE ONTARIO ST. LAWRENCE RIVER AND NORTHEASTERN LAKE ONTARIO

R. Kenyon Ross

Environment CANADA Environnement
20460806 VOL ISS 52 1989
EXC # 001
SK 470 T42
TECHNICAL REPORT SERIES (CANADIAN W
ILDLIFE SERVICE)
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TECHNICAL REPORT SERIES No. 52
Ontario Region 1989
Canadian Wildlife Service

Environment Canada
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Canada

89-04544/

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CANADIAN WILDLIFE SERVICE

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Technical Report Series No. 52
Ontario Region 1989
Canadian Wildlife Service

This series may be cited as:

Ross, R.K. 1989. A re-survey of migrant waterfowl use of the Ontario St. Lawrence River and northeastern Lake Ontario. Technical Report Series No. 52. Canadian Wildlife Service, Ontario Region.

Published by Authority of the
Minister of Environment
Canadian Wildlife Service

© Minister of Supply and Services Canada 1989
Catalogue No. CW69-5/52E
ISBN 0-662-16691-4
ISSN 0831-6481

Copies may be obtained from:

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ABSTRACT

In 1985 and 1986, a repeat survey of migrant waterfowl use was undertaken along the Ontario St. Lawrence River and northeastern Lake Ontario in order to supplement and update the findings of the original 1976/7 survey. As in that work, the birds were counted from a small fixed-wing aircraft flying a standardized route on a similar schedule. The route was divided into 12 zones and the results summarized as waterfowl days for each species group (geese, large and small dabblers, bay ducks, goldeneye, sea ducks, mergansers); comments on individual species are made where possible.

Overall use (spring plus fall) remained largely similar (9.2 million waterfowl days in 1976/7 to 9.8 million waterfowl days in 1985/6); however, seasonal subtotals by species and zone do show changes, some of which are explicable by changing conditions and traditions. Canada Goose counts declined generally in the spring, possibly the result of the principal staging area shifting to the lower South Nation River. The rise in fall goose numbers likely result from population increases of both northern-breeding and local geese. Large dabblers also showed a drop in spring numbers, the reasons for which are not clear although Northern Pintail numbers were well down, possibly due to the prairie drought. Fall counts rose probably in response to the increase in the local Mallard population. Black Ducks declined in abundance relative to the Mallard throughout the survey area and in both migration periods.

Bay ducks, particularly the scaup, continued to comprise the dominant species group which again showed a decreased spring and increased fall use, also without any universal explanation; locally, newly imposed limits on offshore shooting in Lake St. Francis may account for increased fall use there. The goldeneye group, in contrast to the previous ones, showed a general rise in use in both seasons, particularly around the Lake Ontario outlet area. Sea ducks use rose in spring while fall counts were similar to those of the previous survey. Merganser numbers changed little in total although the distribution of fall use shifted to the western zones, particularly in the Bay of Quinte, which might reflect changing fish populations there.

RESUMÉ

Durant la période 1985-1986, nous avons refait un relevé de l'utilisation par la sauvagine en migration, du côte ontarien du fleuve Saint-Laurent et du nord-est du lac Ontario afin d'ajouter aux données du relevé initial de 1976-1977. Comme dans le premier relevé, les oiseaux ont été comptés à partir d'un petit avion à voilure fixe suivant la même route et le même horaire prédéterminés. Le parcours a été divisé en 12 régions et les résultats résumés en jours-oiseaux pour chaque groupe d'espèces (oies et bernaches; grands et petits barboteurs; fuligules; garrots; canards de mer; becs-scie); lorsque cela était possible, nous avons ajouté des observations sur certaines espèces individuelles.

L'utilisation totale (printemps et automne) est demeurée presque la même (de 9,2 millions jours-oiseaux en 1976-1977 à 9,8 millions jours-oiseaux en 1985-1986); cependant les sous-totaux saisonniers par espèce et région indiquent des changement, dont certains s'expliquent par des modifications dans l'environnement et les moeurs. Le fait que le cours inférieur de la rivière South Nation est devenue une aire de repos principale a probablement causé un léger déclin dans le dénombrement printanier de la Bernache du Canada. Le nombre plus élevé d'oies à l'automne pourrait bien être dû à l'augmentation des populations qui se reproduisent au Nord ainsi que des populations locales. Les grands barboteurs ont aussi démontré une baisse au printemps: ce déclin ne s'explique pas facilement même si le nombre de Canards pilets a beaucoup diminué, probablement à cause de la sécheresse dans les Prairies. Les populations dénombrées à l'automne ont probablement augmenté à cause de l'accroissement de la population locale de Canards colverts.

Dans toute la zone d'étude, lors de l'une et l'autre des périodes de migration, nous avons noté que le nombre de Canards noirs avait baissé en comparaison avec celui des Canards colverts.

Les Fuligules, en particulier les morillons, demeurent toujours le groupe d'espèces prédominantes, pour lesquelles on continue de noter une utilisation printanière et automnale, respectivement en baisse et en hausse, toujours sans raisons particulières; de nouvelles lois locales limitant la chasse au large des rivages du lac Saint-François sont peut-être la cause de l'augmentation de l'utilisation de cet endroit à l'automne.

Le groupe des garrots a, contrairement au groupe précédent, démontré en moyenne une utilisation accrue des endroits précités en particulier à l'embouchure du lac Ontario durant l'une et l'autre saison. Les populations de canards de mer ont augmenté au printemps tandis que les résultats des dénombrements automnaux sont demeurés similaires à ceux du relevé précédent. Les effectifs de becs-scie ont très peu varié au total, bien que les populations automnales aient privilégié dans leur utilisation les régions plus à l'ouest, en particulier la région de la baie de Quinte, ce qui pourrait refléter un changement dans les populations de poissons à cet endroit.

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1. Introduction

The lower Great Lakes-St. Lawrence River basin has been identified as a zone of waterfowl habitat of major concern (North American Waterfowl Management Plan 1986). This area not only supports moderately high densities of breeding waterfowl but also contains migrational staging areas of national importance (Lake St. Clair, Long Point, Wolfe Island, Cap Tourmente). The assessment of migrant waterfowl utilization of most of the Ontario shore of the lower Great Lakes was initially reported by Dennis and Chandler (1975) and has since been revised (Dennis et al. 1984). Waterfowl use of the Ontario St. Lawrence River and its outlet from Lake Ontario, however was only first assessed by an aerial survey in 1976 and 1977 (Ross 1984). A second survey of this area was undertaken in 1985 and 1986, the results of which are presented in this paper. The aims of the work are to update information on migrant waterfowl distribution along the survey route, to determine shifts in utilization by waterfowl and, where possible, to explain these changes in terms of known changes in conditions. This survey was also scheduled to be concurrent with and thus contribute to a baseline appraisal of wetlands along the Ontario St. Lawrence River (Bottomley 1986). Uses for this information include assessement of environmental sensitivity and the potential impacts of developments, and the priorizing of areas for particular waterfowl management activities e.g. hunting regulations, land acquisitions, habitat enhancement.

2. Survey Area and Methods

The surveyed area is illustrated in Figure 1 and covers all the Ontario shore of the St. Lawrence River plus the northeastern shore of Lake Ontario as far west as Presqu'ile and including the Bay of Quinte. The lower Ottawa River covered in the 1976/7 work was not flown during this survey. Survey methods were essentially similar to those employed in the earlier work (see Ross (1984) for a more complete discussion of methodology). Briefly, counts were usually carried out by two persons viewing from each side of a Cessna 172 aircraft, flying at approximately 75 m agl and 160 km/h. Flights followed the standardized path of the previous survey along a line roughly 200 m offshore over all habitat likely to be attractive to waterfowl; no limits were placed on observation strip width. Waterfowl were either counted directly or numbers estimated at the species level wherever possible. Larger species groupings (Table 1) were used where segregation to species could not be managed. All observations were recorded on cassette for later transcription and entry into a computerized data base. In most cases, I acted as the prime observer by directing the aircraft to place the bulk of the birds on the right or shore side (my side). This provided a degree of standardization both within the survey and in comparison with the earlier work. As in the earlier survey, all results were recorded at the level of the survey sector (approx. 10 km in length); however, for the purposes of this report, results have been grouped into twelve larger zones illustrated in Figure 1. Date, observers, and extent of coverage of

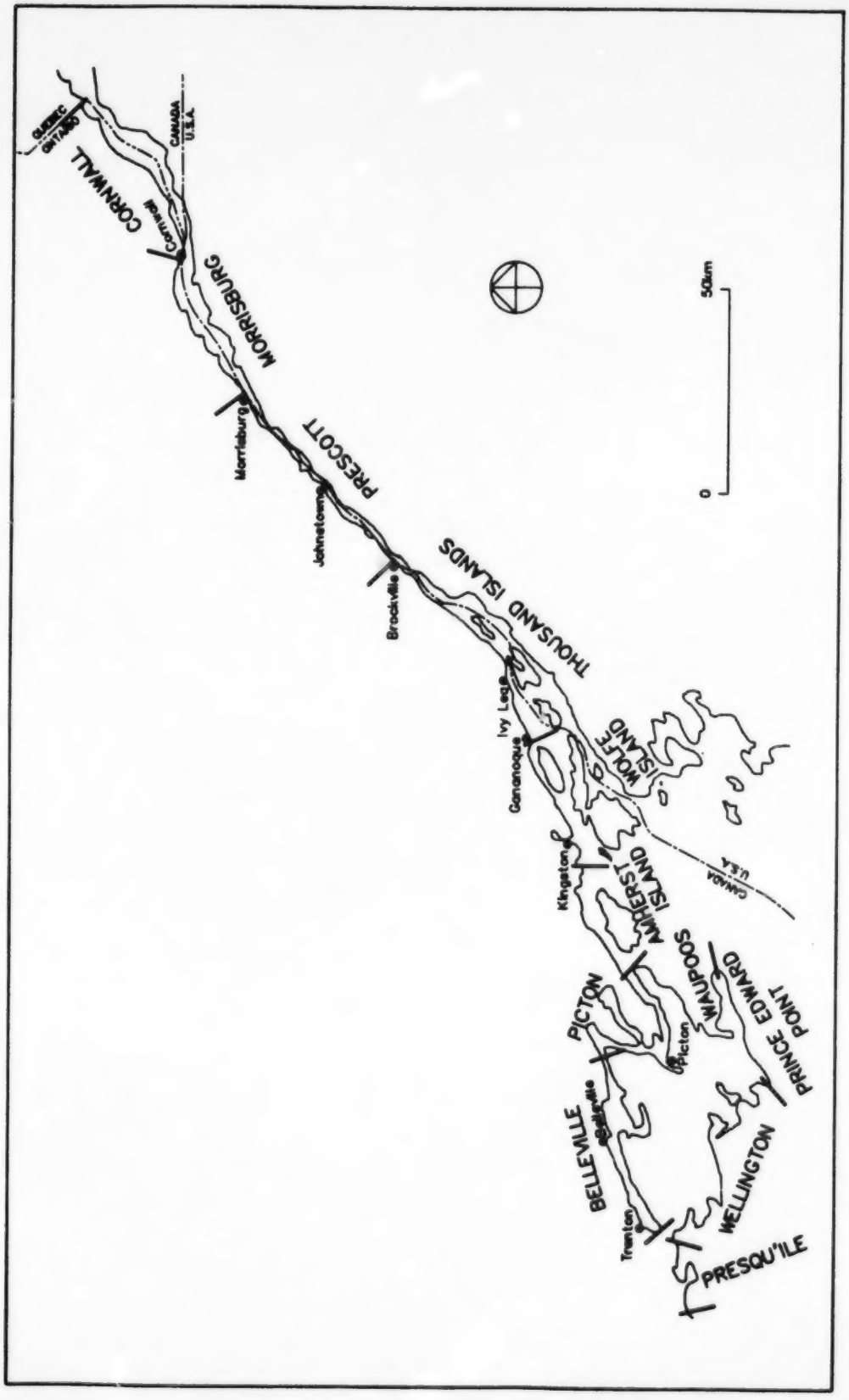

Figure 1: Map of eastern Ontario showing waterfowl survey zones

Table 1: Composition of waterfowl species group categories

Name of group	Species included
Swans	Tundra Swan (Cygnus columbianus), Hute Swan (Cygnus olor)
Geese	Canada Goose (Branta canadensis), Brant (Branta bernicla), Snow Goose (Anser caerulescens).
Large dabblers	Mallard (Anas platyrhynchos), American Black Duck (Anas rubripes), Gadwall (Anas strepera), Northern Pintail (Anas acuta)
Small dabblers	Green-winged Teal (Anas crecca), Blue-winged Teal (Anas discors), American Wigeon (Anas americana), Northern Shoveler (Anas clypeata), Wood Duck (Aix sponsa)
Bay ducks	Redhead (Aythya americana), Ring-necked Duck (Aythya collaris), Canvasback (Aythya valisineria), Greater Scaup (Aythya marila), Lesser Scaup (Aythya affinis).
Goldeneye	Common Goldeneye (Bucephala clangula), Bufflehead (Bucephala albeola).
Sea ducks	Oldsquaw (Clangula hyemalis), White-winged Scoter (Melanitta fusca), Surf Scoter (Melanitta perspicillata), Black Scoter (Melanitta nigra).
Mergansers	Hooded Merganser (Lophodytes cucullatus), Common Merganser (Mergus merganser), Red-breasted Merganser (Mergus serrator).

Table 2: Dates, observers, and extent of coverage of flights during 1985/6 resurvey of the Ontario St. Lawrence River and northeastern Lake Ontario

Year	Month	Day	Coverage	Observer(s)*
1985	March	14	All eastern zones	RKR, GM
	March	29	All eastern zones	RKR, DF
	April	11	All eastern zones	RKR, GM
	April	25	All eastern zones	RKR, GM
	May	13	All eastern zones	GM
	May	31	Cornwall, Morrisburg, Prescott	GM
	June	7	Thousand Islands, Wolfe Island	GM
	August	29	All eastern zones	GM
	September	11	All eastern zones	RKR, GM
	September	26	All eastern zones	RKR, GM
	October	10	Wolfe Island	RKR, GM
	October	23	All eastern zones	RKR, GM
	November	6	Wolfe Island	RKR, GM
	November	7	All eastern zones except Wolfe Island	RKR, DF, GM
	November	18	All eastern zones	RKR, TK
	December	5	All eastern zones	RKR, GM
	December	19	Wolfe Island	RKR, DF
1986	January	2	All zones	RKR, TK
	March	17	All western zones	RKR, DF
	March	27	All western zones	RKR, DF
	April	16	All western zones	RKR, DF
	April	29	All western zones	RKR, DF
	May	15	All western zones	RKR
	June	3	All western zones	RKR
	August	27	All western zones	RKR
	September	15	All western zones	DF
	September	24	All western zones	DF, DAW
	October	10	All western zones except Belleville and Picton	RKR
	October	17	Belleville and Picton	RKR
	October	23	All western zones except Belleville and Picton	RKR
	November	5	All western zones except Belleville and Picton	RKR, DF
	November	14	Belleville, Picton	RKR
	November	20	All western zones except Belleville and Picton	RKR, DF, TK
	December	8	All western zones except Belleville and Picton	RKR, DF
	December	17	Belleville and Picton	RKR
1987	January	13	All zones	RKR, DF, TK

* See names of observers in Acknowledgements section.

each flight are summarized in Table 2. Flights were more frequent in this work than in the earlier survey, although wherever possible, approximately similar dates have been used. This survey was spread over two years; the Wolfe Island zone and those to the east were covered in 1985 while those to the west were flown in 1986.

Estimates of waterfowl use (waterfowl days) of the 12 zones were calculated as in Dennis and Chandler (1974) by averaging results for each successive pair of surveys, multiplying these results by the number of days separating each pair and summing over the entire migration period. For the spring period (March 1 - June 1), the March 1 values were assumed equal to those of the March 14 survey in 1985 and the March 17 survey in 1986; the June 1 values were set as those of the appropriate May 31 or June 7 survey in 1985 and the June 3 survey in 1986. In the fall period (August 16 - January 1), the August 16 values were taken as those of the August 29 survey in 1985 and the August 27 survey in 1986 and the January 1 values were assumed equal to those of the January 2 survey in 1985 and the January 13 survey in 1986.

3. Results and Discussion

Survey results are summarized in two pairs of tables:

1. Tables 3 and 4 provide estimates of migrant waterfowl use (waterfowl days) of each survey zone, both in the spring and fall, and include the results from the 1976/7 survey to facilitate comparisons. Survey results by species group are also presented in Figures 2 and 3 to illustrate the migration profiles.

2. Tables 5 and 6 present, for the spring and the fall respectively, the dates and sizes of the highest zone counts for the various species and species groups; these demonstrate the peak migrational periods and the extent of local concentration of the birds during migration. While these tables are partially comparable to Tables 7 and 8 in Ross (1984), it should be noted that the two Ottawa River zones were not covered in the present work, and this leads to some minor changes in interpretation.

3.1 Geese

Spring goose use, primarily by Canada Geese (Branta canadensis) decreased in all but the Prescott, Thousand Islands and the two Bay of Quinte zones where only slight rises were recorded in what were among the lowest levels of all zones. The fact that these decreases were so wide-spread and occurred in both years of the survey, suggests that there has been a real change in Canada Goose distribution in the spring. In recent years, Canada Geese have been staging heavily in the Bourget-Riceville area, along the lower South Nation River east of Ottawa, with estimates of over 100,000 geese being seen at one time (B. Di Labio, pers. commun.). This locale may be attracting birds which normally would

Table 3. Quantity of waterfowl use (in 1000's of Waterfowl Days) of survey zones along the Ontario St. Lawrence River and northeastern Lake Ontario in spring (1976/7 and 1985/6).

Zone		Geese	Large Dabblers	Small Dabblers	Bay Ducks	Goldeneyes	Sea Ducks	Mergansers	ZONE TOTAL
Cornwall	1976/7	14.0	4.6	0.3	334.1	47.7	0.1	22.5	423.5
	1985	0.2	2.8	1.0	123.4	21.6	0	18.7	167.9
Morrisburg	1976/7	427.5	5.5	0.2	17.3	4.7	Tr*	5.2	460.8
	1985	88.1	3.1	0.7	2.1	3.1	0	7.0	104.2
Prescott	1976/7	0.8	2.6	0.1	119.9	21.4	Tr	10.4	155.5
	1985	6.1	0.8	0.2	27.3	17.8	Tr	9.4	61.8
Thousand Islands	1976/7	2.5	3.3	1.0	429.5	46.3	0.4	34.0	517.1
	1985	3.6	2.7	0.6	343.9	66.1	0.4	56.8	474.2
Wolfe Island	1976/7	529.1	22.7	2.5	1136.4	85.1	1.5	44.1	1821.5
	1985	297.7	5.4	2.0	1052.9	122.9	8.6	47.6	1537.1
Amherst Island	1976/7	27.7	4.9	1.7	334.1	55.2	17.1	18.3	459.5
	1986	10.8	2.8	0.1	169.1	81.2	71.3	7.5	342.6
Waupoos	1976/7	71.9	1.5	0.5	452.1	41.5	33.3	22.2	623.1
	1986	2.6	0.9	Tr	253.8	40.7	116.0	14.9	428.8
Prince Edward Point	1976/7	2.5	1.1	0.1	1.9	48.2	15.1	7.3	76.5
	1986	0.1	0.4	0.1	124.0	46.6	16.1	7.6	194.8
Wellington	1976/7	0.3	1.3	Tr	84.9	26.7	16.5	14.5	144.1
	1986	0.2	2.1	0.3	35.5	20.7	30.6	19.2	108.6
Presqu'ile	1976/7	4.7	7.3	1.1	147.9	29.9	26.7	6.6	224.3
	1986	0.1	0.4	0.1	124.0	46.6	16.1	7.6	194.8
Belleville	1976/7	0.8	2.4	0.4	4.1	2.6	Tr	39.3	49.8
	1986	2.3	1.9	0.8	6.4	7.2	0	28.7	47.2
Picton	1976/7	0.9	0.2	Tr	90.7	18.2	0.3	18.5	129.0
	1986	6.2	0.7	0	46.3	7.5	0.2	12.9	73.9
COLUMN TOTAL	1976/7	1082.7	57.4	7.9	3152.9	427.5	111.0	242.9	5084.7
	1985/6	420.0	24.7	5.9	2186.7	473.2	294.6	233.7	3639.0

* tr = trace (< 0.05)

Table 4. Quantity of waterfowl use (in 1000's of Waterfowl Days) of survey zone along the Ontario St. Lawrence River and northeastern Lake Ontario in fall (1976/7 and 1985/6).

Zone		Swans	Geese	Large Dabblers	Small Dabblers	Bay Ducks	Goldeneyes	Sea Ducks	Mergansers	ZONE TOTAL
Cornwall	1976/7	0	4.1	15.3	1.1	65.9	95.0	Tr*	71.9	257.4
	1985	0	0.1	12.9	1.0	445.4	95.2	0	13.7	568.5
Morrisburg	1976/7	0	188.3	21.3	3.3	24.5	0.5	Tr	50.3	288.3
	1985	0	336.6	58.4	1.2	7.2	1.9	0	21.2	426.7
Prescott	1976/7	0	0.6	0.6	Tr	17.4	22.5	Tr	11.9	53.8
	1985	0	0.7	9.5	Tr	42.4	27.6	Tr	9.1	89.5
Thousand Islands	1976/7	0	0.1	2.5	0.4	3.3	11.7	Tr	14.9	32.9
	1985	0	0	8.7	0.4	0.4	37.4	0	8.7	55.5
Wolfe Island	1976/7	0	120.5	216.9	24.3	1215.7	29.5	6.9	5.0	1713.3
	1985	0	157.5	338.9	33.5	1274.6	95.0	1.1	32.2	1932.8
Amherst Island	1976/7	0	0.7	40.1	5.0	38.5	20.4	8.2	0.4	113.4
	1986	0	48.1	26.7	0.4	279.2	28.4	7.2	5.3	395.4
Waupoos	1976/7	0	0.1	6.3	Tr	463.4	8.9	1.1	2.2	482.1
	1986	0	0.2	3.0	0.1	414.4	28.4	12.7	1.4	460.3
Prince Edward Point	1976/7	0	0.5	7.9	0.2	874.3	63.3	40.5	2.6	989.2
	1986	0	0.4	2.8	Tr	1062.5	50.1	10.5	4.7	1131.1
Wellington	1976/7	0	Tr	2.2	Tr	72.8	53.1	8.3	0.3	136.9
	1986	0.3	0.7	4.1	Tr	489.0	46.8	30.7	14.2	585.9
Presqu'ile	1976/7	0	Tr	5.4	1.0	39.5	24.3	3.5	0.2	74.1
	1986	0	0	6.0	0.2	306.8	30.9	6.0	6.1	356.0
Belleville	1976/7	0	Tr	0.2	0.5	Tr	Tr	Tr	Tr	0.8
	1986	0	11.7	13.3	0.9	11.2	5.4	0	60.0	102.6
Picton	1976/7	0	Tr	2.3	0.8	1.0	7.0	Tr	3.4	14.6
	1986	0	Tr	11.3	0.8	0.9	21.6	6.8	14.1	55.5
COLUMN TOTAL	1976/7	0	314.9	321.0	36.6	2816.3	336.2	68.5	163.1	4156.8
	1985/6	0.3	556.0	495.6	38.5	4334.0	468.7	75.0	190.7	6159.0

* tr = trace (< 0.05)

Figure 2: Timing and duration of waterfowl use along the Ontario St. Lawrence River and northeastern Lake Ontario during the spring migration, 1985/6

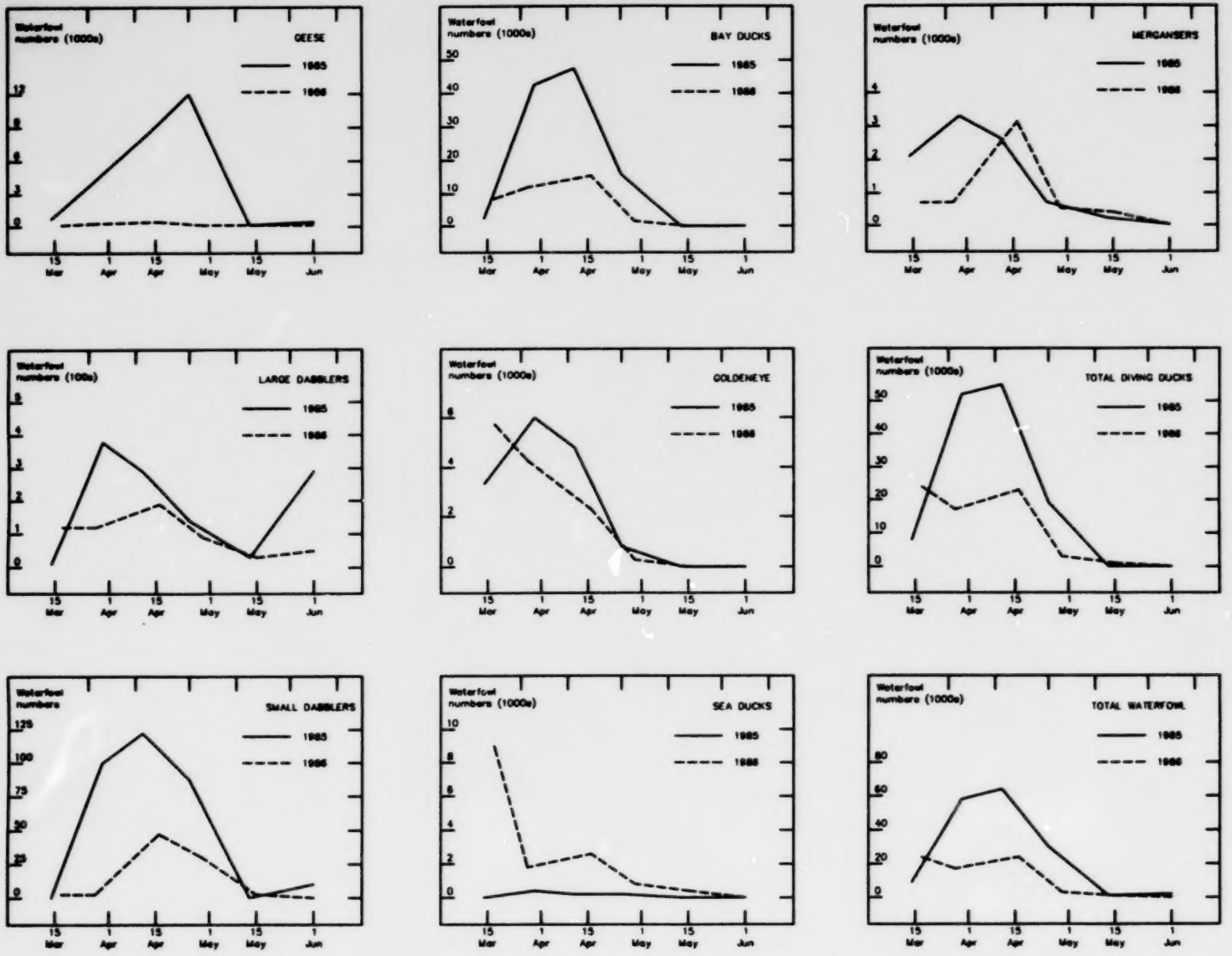

Figure 3: Timing and duration of waterfowl use along the Ontario St. Lawrence River and northeastern Lake Ontario during the fall migration, 1985/6

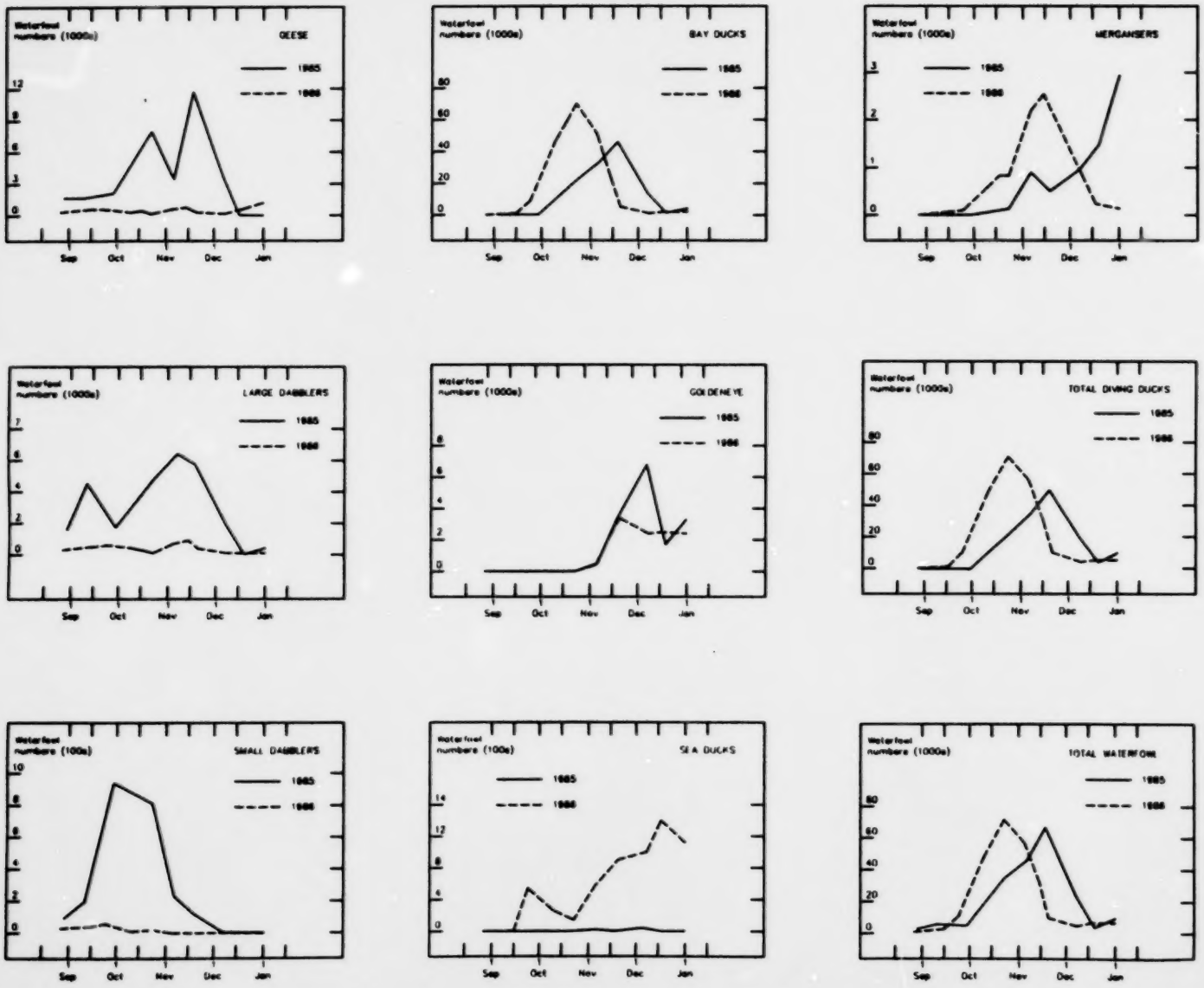

Table 5. Summary of high zone counts for the spring survey

Species	Total	Zone	Date
Geese	9720	Wolfe Island	25 April 1985
Snow Goose	8	Morrisburg	25 April 1985
Canada Goose	9720	Wolfe Island	25 April 1985
Brant	126	Amherst Island	15 May 1986
Large Dabblers	161	Wolfe Island	11 April 1985
Mallard and	115	Thousand Islands,	29 March 1985
Black Duck		Wolfe Island	11 April 1985
Gadwall	32	Wolfe Island	31 May 1985
Northern Pintail	22	Wolfe Island	29 March 1985
American Wigeon	41	Morrisburg	11 April 1985
Small Dabblers	59	Wolfe Island	25 April 1985
Teal Sp.	37	Wolfe Island	25 April 1985
Bay Ducks	34793	Wolfe Island	11 April 1985
Canvasback	2205	Wolfe Island	11 April 1985
Redhead	74	Thousand Islands	29 March 1985
Ring-necked Duck	272	Wolfe Island	11 April 1985
Scaup sp.	24451	Wolfe Island	11 April 1985
Sea Ducks	4056	Waupoos	17 March 1986
Scoter sp.	167	Waupoos	29 April 1986
Oldsquaw	3950	Waupoos	17 March 1986
Goldeneyes	4272	Wolfe Island	29 March 1985
Common Goldeneye	4211	Wolfe Island	29 March 1985
Bufflehead	247	Amherst Island	16 April 1986
Mergansers	1797	Thousand Islands	29 March 1985
Common Merganser	885	Wolfe Island	11 April 1985
Red-Breasted Merganser	313	Wellington	19 May 1986
Hooded Merganser	60	Thousand Islands	29 March 1985

Table 6. Summary of high zone counts for the fall survey

Species	Total	Zone	Date
Swan	8	Wellington	20 November 1986
Mute Swan	5	Wellington	20 November 1986
			8 December 1986,
			13 January 1987
Geese	3965	Wolfe Island	18 November 1985
Snow Goose	10	Morrisburg	7,18 November 1985
Canada Goose	7762	Morrisburg	18 November 1985
Large Dabblers	5696	Wolfe Island	6 November 1985
Mallard and Black Duck	3595	Wolfe Island	11 September 1985
Gadwall	175	Morrisburg	23 October 1985
Northern Pintail	98	Wolfe Island	10 October 1985
Wigeon	900	Wolfe Island	29 September 1985
Small Dabblers	902	Wolfe Island	29 September 1985
Teal Sp.	140	Wolfe Island	11 September 1985
Bay Ducks	33766	Prince Edward Point	10 October 1986
Canvasback	440	Wolfe Island	2 January 1986
Redhead	737	Wolfe Island	23 October 1985
Ring-necked Duck	1402	Wolfe Island	6 November 1985
Scaup sp.	33764	Prince Edward Point	10 October 1986
Sea Ducks	543	Wellington	24 September 1986
Scoter sp.	543	Wellington	24 September 1986
Oldsquaw	431	Wellington	5 November 1986
Goldeneyes	3808	Cornwall	5 December 1985
Common Goldeneye	3808	Cornwall	5 December 1985
Bufflehead	1184	Prince Edward Point	20 November 1986
Mergansers	1955	Belleville	14 November 1986
Common Merganser	514	Morrisburg	7 November 1985
Red-Breasted Merganser	150	Morrisburg	7 November 1985
Hooded Merganser	90	Morrisburg	18 November 1985

have used other areas, particularly in the more easterly zones where increased fall tillage and shift to silage corn cultivation may have reduced foraging opportunities, as has the reduction in flooded land brought on by the channelizing of the upper South Nation River (M. Eckersley, pers. commun.). Otherwise, relative distribution of spring use among the various zones was still quite similar to the results of the earlier survey.

Timing of the spring migration has not changed as the overall peak still occurred in late April-early May, primarily at Wolfe Island which accounted for over 70% of the total use along the survey route. Most other sectors peaked earlier which is probably indicative of migrants briefly stopping off en route to more major staging areas i.e. Wolfe Island and Bourget-Riceville. Peak zone counts (Table 5) occurred in the Wolfe Island zone as in 1976/7 although numbers were much lower. This in part may be due to survey timing as higher maximum counts on Wolfe Island have been recorded in the intervening years (27,000, 2 - 5 May 1980, Weir (1980); 47,800, 27 April 1981, Ross (1983)).

Fall use by geese was higher than previously recorded although the increase was largely restricted to those zones which offered significant sanctuary and as well held local breeding concentrations (Morrisburg, Wolfe Island and Amherst Island). The increased use may, in some zones, reflect the rise in the mid-Atlantic sub-population, and the increasing numbers of local breeders; as well it could also be due to hunting pressure increasing concentrations of all geese on sanctuaries. Although its contribution was still quite small, the Belleville zone held more geese in the fall than in 1976/7, mostly in the form of a flock in Muscote Bay. Whether these birds are northern migrants or are local breeders, possibly from Camden Lake, is not known; occasional breeding of isolated pairs of Canada Geese in Prince Edward County has also been recorded (Sprague and Weir 1984).

Migration phenology in the fall was similar to that found in the earlier survey in that peak counts in each zone occurred variably between mid-October and mid-December.

Atlantic Brant (Branta bernicla) were recorded only once during the survey (126, Amherst Island zone, 15 May 1986); the main spring passage normally occurs in the latter half of May. In the fall, migrants pass through sporadically in October and November and may be missed. The Atlantic Brant population has recently risen considerably after a series of favourable breeding seasons in the Arctic (Kirby and Obrecht 1982) and this is reflected in some of the counts made by the Kingston Field Naturalists (8000, Amherst Island, 15 May 1981, Weir (1981); 10,000, Wolfe Island, 12 May 1987, Weir (1987)). Fall counts were much lower; 1000 birds at Prince Edward Point on 20 October 1979 (Weir 1979) was the largest published record since the earlier survey.

Snow Geese (Anser caerulescens) were only noted on six occasions during the survey, four in the Morrisburg zone and two in the Wolfe Island zone. No change in status was evident.

3.2 Large Dabblers

This group decreased by 57% in spring use along the survey route in comparison to the earlier survey. The decline was particularly

evident in the two most heavily used zones (Wolfe Island, down 76%; Presqu'ile, down 95%). The reason is not evident although it must be noted that the survey is not designed for these species which spend much of their time foraging inland making counts highly variable; as well, Northern Pintail which can comprise a substantial proportion of this group were seen in much lower numbers than during the earlier survey (see later). Fall use rose considerably from that found in the earlier survey, particularly in the Morrisburg and the Wolfe Island zones both of which offer sanctuary situations for the birds. This could be due to the continuing rise in the Mallard (Anas platyrhynchos) population breeding in Ontario (Ankney et al. 1987) possibly combined with a training effect of high hunting pressure further concentrating the birds in safe areas. The Bay of Quinte zone also showed a considerable rise although use levels of use were still low in comparison to other zones.

Mallards and American Black Ducks (Anas rubripes) predominate in this group (65% and 28% respectively of the total duck days for large dabblers). Migrational phenologies in both spring and fall were virtually identical to those noted in 1976/7. In the spring, there was a considerable post-breeding aggregation in the eastern survey zones, particularly Wolfe Island (see Figure 1). In the fall of 1985 (Figure 2), "burn-out" caused by the opening of hunting season was clearly demonstrated by the drop in numbers just after the season started and followed by an increase with the arrival of new migrants.

The proportion of Blacks and Mallards observed in the two surveys are compared in Table 7 and demonstrate a significant drop in the proportion of Black Ducks for both groups of zones and for all time periods. This is undoubtedly related to the general decline of the Black Duck in southern Ontario (Ankney et al. 1987). Interestingly, these decreases were greater in the eastern zone group which had generally a higher proportion of Blacks in 1976/7. No explanation is evident.

Gadwalls (Anas strepera) (6% of the total large dabbler use) occurred in larger numbers and were much more widespread than during the earlier survey. This species was found in all but the Picton zone although the highest numbers were still concentrated in the Morrisburg and Wolfe Island zones where high zone counts in the fall (Table 6) were three times that recorded in 1976/77. This rise in the Gadwall population in southern Ontario has been well-documented (Cadman et al. 1987). Gadwall were first noted in mid-April, rose to peak numbers late in the month after which they quickly dispersed onto the breeding territories; some post-breeders were noted at the end of May. In the fall, most were recorded during September and some remained until mid-November; a flock ranging in size between 100-175 Gadwall was noted in the Morrisburg sanctuary until 7 November 1985.

Fewer Northern Pintail (1% of total use by large dabblers) were seen in the spring than during the earlier survey. This species passes through rapidly in the first half of April and surveys may have missed the peak. The low numbers might also reflect the substantial decline of the pintail on its major breeding ground in the Prairies (Anon. 1987). Fall counts were low and generally similar to those recorded in 1976/7.

Table 7. Percentage of Black Ducks and total number of Black Ducks and Mallards identified in two groups of survey zones over five time period in 1976/7 and 1985/6

Zone Group		% Black Duck (N = total number of Black Duck and Mallards identified)				
		1 March - 19 April	16 April - 1 June	11 September - 19 October	16 October - 15 November	16 November - 17 December
Cornwall Morrisburg Prescott	1976/7	82 (523)	80 (114)	18 (701)	47 (789)	80 (128)
	1985/6	46 (192)	10 (177)	10 (607)	36 (471)	30 (493)
All Zones West of Prescott	1976/7	72 (978)	46 (124)	29 (1864)	41 (10644)	72 (1359)
	1985/6	55 (580)	23 (297)	23 (6665)	40 (2073)	61 (1389)

3.3 Small Dabblers

Utilization levels by the small dabbler group were generally low as these species do not tend to concentrate in habitats surveyed. Results were generally very similar to those of the earlier survey in all zones.

Although the Green-winged Teal (Anas crecca), Blue-winged Teal (Anas discors), Wood Duck (Aix sponsa) and Northern Shoveler (Anas clypeata) were occasionally seen on the surveys, only the American Wigeon (Anas americana) (87% of total small dabbler use) was encountered in significant numbers, usually in association with large bay duck flocks on Lake St. Francis and around Wolfe Island. No change in status of any of these species was evident.

3.4 Bay Ducks

This is the most abundant species group found along the survey route and because of their habit of forming large flocks in nearshore open water, the survey technique is very effective in their enumeration. Overall utilization estimates in both the spring and fall showed considerable shifts between the two surveys (Tables 3 and 4), although total use (spring + fall) remained fairly similar (5969200 waterfowl days in 1976/7; 6520700 in 1985/6). Spring use showed a considerable drop over the period, being down in ten of twelve zones. This decline was particularly evident in the three eastern zones where spring use is concentrated early in the season when the fast-moving water provides some of the few open sections for the birds. As there was no evident difference in ice conditions between the two surveys in these areas, there remains the possibility that some decline in staging habitat quality has occurred around Johnstown and the inlet into Lake St. Francis; ducks tended to leave these areas as soon as ice had gone from other sites, thus suggesting that the habitat may already have been marginal. Declines in the Wolfe Island and nearby zones which held the bulk of the spring bay ducks were proportionately much less. Fall use in contrast to the spring situation was substantially higher in 1985/6 with increases in eight of the twelve zones. Proportional increases were particularly large in the Cornwall, Amherst Island, Wellington and Presqu'ile zones, which all had relatively low levels of use in 1976/7. Zones having a higher utilization in 1976/7 increased proportionally less in 1985/6 e.g. Wolfe Island, Waupoos, Prince Edward County. Reasons for these changes most likely involve fortuitous timing of migration waves and surveys although there are special cases in two zones. The rise in the Cornwall zone may well have resulted from the change in hunting regulations in 1980 which limited shooting offshore to within 300 metres of the shoreline or nearest emergent weed bed; this possibly made available loafing areas within the surveyed area that were previously shot over (only the Ontario section of Lake St. Francis was surveyed). The Prescott zone showed a considerable increase in utilization although the level was still quite low; this was due to the appearance of a new fall staging flock near two large factories east of Brockville. The location is just dowstream of two large factories which may be contributing warm water or otherwise increasing productivity in the immediate area.

The two scaup species (Aythya marila, A. affinis) made up 95% of total use by bay ducks in the survey area. Migrational phenology remained as described in Ross (1984) and was characterized by considerable variability as timing of peak counts changed from zone to zone as well as from year to year. In Table 8, scaup counts made during the first week of November (as part of the annual continent-wide Canvasback survey) were highly variable (mean 47703, range 24449-74739). These values did not correlate in any way with population indices from the breeding grounds which suggested that the birds did not stage in the area for long periods of time but moved through in waves probably associated with weather conditions which imposed considerable variability in the survey results. Proportions of Greater and Lesser Scaup were very difficult to assess from the air although Greater Scaup appeared more common around Wolfe Island and Lesser Scaup more common around Prince Edward County. A collection of hunter-killed birds taken on Wolfe Island in 1986 revealled 18 Greater Scaup and 6 Lesser Scaup while a group of ducks killed in fisherman's nets during fall 1985 on the south shore of Prince Edward County yielded 40 Lesser Scaup to 12 Greater Scaup. The extent of resource partitioning between the two species is presently being studied.

The distribution and migrational phenology of the Canvasback (Aythya valisineria) remained virtually identical to that recorded in the earlier survey. Notable in the spring was a record of 9920 Canvasback in the Kingston-Wolfe Island-Prince Edward Point area between 27 and 30 March 1986 (Weir 1986). One property of the fall migration has come to light as a result of the annual census in early November (Table 8) whose results show a strong dichotemy between large and small values. This suggests that the bulk of this species passes through quite rapidly in a wave in the first half of November. This is indicated by weekly surveys of Wolfe Island in the fall of 1986 (Ross, unpublished data) which gave the following results: 321 on 5 November, 3766 on 10 November, 573 on 20 November. Also supporting this conclusion was the observation of 10,000 Canvasbacks on Lake St. Francis in mid-November 1976 (Sprigings 1977) although there has been no record of such a high count re-occurring. No change in status was evident for the Redhead (Aythya americana) or the Ring-necked Duck (A. collaris), both of which are difficult to identify from the air.

3.5 Goldeneye

This category, which includes both Common Goldeneye (Bucephala clangula) and Bufflehead (Bucephala albeola), comprised the second most abundant group of diving ducks of the survey. Like the bay ducks, these species were effectively counted as they concentrated along the nearshore and flushed close to the aircraft. Total utilization rose in both the spring and fall from that of the earlier survey. In the spring, this rise was relatively minor although there was considerable re-distribution among the zones. As with the bay ducks, the three most easterly zones showed declines in utilizations while zones west to Amherst Island demonstrated substantial rises in use; little trend was evident in the remaining zones. Fall use showed increases in all but two zones; most notable were the rises in the zones of the Lake Ontario outlet (Thousand Islands to Waupoos) which in the 1976/7 survey were noted as having particlarly low fall use; reasons for this are not clear.

Table 8. Counts of scaup and Canvasback from the eastern Ontario section of the annual Continent-Wide Canvasback Survey (first week of November)

Species and Zones / Year	Canvasback			Scaup sp.		
	Cornwall	Wolfe Island Amherst Island	Waupoos - Presqu'ile	Cornwall	Wolfe Island Amherst Island	Waupoos - Presqu'ile
1976	35	800	0	3698	23532	26999
1977	0	630	0	85	16990	8960
1978	30	292	0	8500	14190	12200
1979	41	144	2	5610	25420	49319
1980	N/A	5132	210	N/A	19560	37810
1981	0	3533	732	450	14915	15634
1982	N/A	3	7	N/A	14994	25640
1983	N/A	60	10	N/A	27257	32130
1984	N/A	60	20	N/A	10890	30655
1985	13	109	41	11396	26389	37812
1986	1093	321	204	20580	23889	47142

The Common Goldeneye comprised 89% of total use by this group. Migrational phenology remained as reported from the earlier survey; essentially numbers rose in the ice-free zones to peak levels in the winter and dropped with the progress of spring. Zones which froze over showed peaks in the first half of April and the last half of November during the two migration periods respectively. Overwintering numbers were variable and depended on ice conditions. On 2 January 1986, which was unseasonably mild with very little ice, 5308 goldeneye were counted; in contrast, on 13 January 1987, only 4092 were detected along the whole route which was much more heavily iced, especially along the St. Lawrence River section which accounted for virtually all the drop in numbers.

The Bufflehead was present in smaller numbers (11% of total use by the group). Most passed through on migration although a few overwintered on Lake Ontario (389 in 1986, 322 in 1987). Peak spring counts occurred in mid-April whereas, in the fall, numbers were highest in the latter half of November. Distribution differed considerably between the seasons. In the spring, birds were observed throughout the route although highest numbers were found in the Lake Ontario zones. In the fall, except for very small numbers in the Morrisburg zone, the birds were restricted to the Lake Ontario zones even though total utilization was much higher (31599 duck days in spring; 71435 duck days in fall).

3.6 Sea Ducks

As in 1976/7, the sea ducks were largely restricted to the Lake Ontario zones. Spring counts were much higher than previously noted due mostly to very high Oldsquaw (*Clangula hyemalis*) numbers early in the season; particularly large increases were noted in the Amherst and Waupoos zones where the birds were concentrated along an ice front. In the fall, numbers were fairly similar between the two surveys although there may have been some minor changes in distribution among the Prince Edward County zones.

Oldsquaw comprised the bulk of sea ducks seen (93% of total use by the group). Spring counts in 1985/6 were consistently higher than in 1976/7 in all zones of northeastern Lake Ontario except Presqu'ile. In all cases, peak counts occurred in the first survey (mid-March) and numbers declined thereafter, small numbers still being present up to mid-May. Large migrant flocks noted during the 1976/77 survey were not encountered although they have also been recorded by Sprague and Weir (1984); 10000 Oldsquaw were noted at Prince Edward Point on 4 May 1986 (Weir 1986). As in 1976/7, counts in the fall were highly variable but showed a rising trend to a peak in the winter depending on ice conditions; the Christmas count for the Prince Edward Point area yielded 9350 Oldsquaw on 17 December 1983 (Ellis 1984).

Scoters were seen irregularly and in small numbers during both the spring and fall surveys. Little new can be added about the migrational chronology. Proportions of the three species are difficult to assess given the small numbers seen, although groups and singles of the White-winged Scoter (*Melanitta fusca*) tended to be encountered most frequently. This species was also one seen in highest numbers by the Kingston Field Naturalists; notable records were 3000 seen migrating past Amherstview on 21 May 1985 (Weir 1985a) and 4500 in the Prince Edward

Point area on 28 November 1985 (Weir 1985b). During the survey, however, the Black Scoter (Melanitta nigra) accounted for 62% of total utilization by the scoter group due solely to the observation of a large group (447) near Wellington on 24 September 1988; this is the largest flock reported from Prince Edward County to date (cf. Sprague and Weir 1984). Surf Scoters (Melanitta perspicillata) were noted very sporadically and in small groups.

3.7 Mergansers

Little change between the two surveys can be determined for spring utilization level and distribution of mergansers. In the fall, counts indicated a slight rise in use of the surveyed area with a considerable shift in distribution. Fall use in the far eastern zones all dropped by varying degrees while utilization rose in all western zones except Waupoos. The most notable increase occurred in the Belleville zone where very few birds were seen in 1976/7 and yet it had the highest level of use in 1985/6. Fish communities in this zone have shifted in recent years towards an increase in the proportion of larger fish attractive to piscivorous waterfowl (Hurley, 1986); the population of yellow perch (Perca flavescens), a shallow water species often taken by mergansers has increased in particular. One would, however, then expect to see a concomitant increase in spring use, which if anything may have declined; this is probably related more to habitat availability as that zone was largely open during the peak of merganser migration in late March 1976 but was mostly frozen at that time period in 1986.

Common Mergansers (Mergus merganser) provided approximately 90% of the waterfowl days for the merganser group. They wintered in significant numbers in the St. Lawrence River zones where numbers rose in the spring to peak in late March. Counts showed a later peak (mid-April, Figure 2) in the more westerly zones in response to ice conditions there. The fall migration started in late September peaking in the western zones in early November; between 5000 and 10000 Common Mergansers were seen in Hay Bay in the Picton zone on 16 November 1982 (Weir 1982). In the eastern zones, small peaks also occurred in early November although, after a slight drop, numbers thereafter rose to wintering levels.

Red-breasted Mergansers (Mergus serrator) were recorded much less frequently (8% of total utilization by mergansers) although admittedly they are difficult to distinguish from the air; the estimate of Red-breasted Mergansers comprising 20% of mergansers in 1976/7 resulted largely from a sighting of a single large flock (2600 on 8 November 1977, Morrisburg). No significant overwintering was evident. In the spring, migrant Red-breasted Mergansers were usually first encountered in early to mid-April and peak zone counts were mostly made in the first half of May. The few fall observations occurred between 5 November and 8 December and no pattern could be discerned.

Hooded Mergansers (Lophodytes cucullatus) were seen on very few occasions as in the earlier survey.

4. General Discussion

4.1 Summary by Zone

Overall use by waterfowl of the whole survey area (St. Lawrence River and eastern Lake Ontario) has changed little in the nine years intervening between the two surveys (9.2 million waterfowl days in 1976/7 to 9.8 million waterfowl days in 1985/86); however, seasonal sub-totals by species and zone show some considerable shifts over that time period. Some of these changes may well reflect sampling error given the similarity in total utilization estimates; this is a natural result of spreading a relatively small number of surveys over a migration period in which waterfowl pass through in waves and do not change steadily and predictably in numbers. There still remain some differences for which there are logical explanations in terms of changes in population, migrational habits, habitat or hunting regulations. These shifts in use and plausible explanations are summarized by survey zone below.

4.1.1 Cornwall

Spring use of this zone was much lower in 1985, largely due to reduced counts of bay ducks and goldeneye. As ice conditions were similar in the two survey periods, this change in use may point to some change in conditions in the inlet area near Cornwall which usually supports very large numbers of ducks early in the spring migration. Fall use conversely was much increased over the earlier survey due mostly to increased bay duck numbers. Hunting regulations changed in 1980 limiting off-shore shooting from boats to within 300 metres of shore; this possibly made available loafing areas within the survey area that were previously shot over. Whether the regulation change increased utilization of the lake or caused re-distribution of birds within it, is undetermined. Merganser counts were much lower during the fall but no cause was evident.

4.1.2 Morrisburg

This zone showed a decrease in spring use similar to that in the previous zone, although, in this case, it was due to reduced utilization by Canada Geese. Inland sites along the South Nation River (Bourget-Riceville) which have recently been found to hold very large numbers of geese may in fact be attracting birds from the surveyed area (including the St. Lawrence Parks) where more fall tillage and silage corn cultivation may have made the area less desirable. Fall use showed a rise, again mostly due to Canada Geese which congregate in the baited Upper Canada Sanctuary. Increased use in this case is probably due to the overall increase in the mid-Atlantic sub-population (North American Waterfowl Management Plan 1986) plus the rising number of local breeders.

4.1.3 Prescott

Spring utilization in this zone was lower than during the previous survey because of a decrease in bay duck numbers. This drop largely came in the form of decreased use of the Johnstown area in the early spring (as also happened at the Lake St. Francis inlet area). In contrast, fall estimates rose due to increased bay duck counts. A new staging flock was found at the west end of the zone located near the outfalls from two large factories which may be enriching local habitat.

4.1.4 Thousand Islands

Fall use showed a moderate increase over that from the earlier survey caused mostly by a rise in goldeneye numbers late in the season. Total spring use may have declined slightly due to reduced number of bay ducks although goldeneye utilization still showed an increase, probably a result of increased overwintering.

4.1.5 Wolfe Island

This remains the most important zone for migrant waterfowl in eastern Ontario, with high overall levels of use in both the spring and fall. Spring counts showed a decline in use by geese similar to the Morrisburg zone and may reflect slight changes in migration routes. Large dabblers also dropped in numbers, possibly due to sampling variability as well as a substantial reduction in Northern Pintail counts. Goldeneye counts rose as in the Thousand Island zone in both the spring and fall, likely resulting from increased overwintering. Fall counts of Canada Geese and large dabblers, particularly Mallards, rose reflecting their increasing populations. Merganser utilization in the fall was also larger although no reason is evident.

4.1.6 Amherst Island

Trends for most species were largely similar to those for Wolfe Island, the exceptions being large dabblers, which showed an unexplained decrease in use in the fall, and bay ducks, which demonstrated a substantial decrease in the spring and an eightfold rise in fall utilization. This latter trend was also evident in other Lake Ontario zones.

4.1.7 Waupoos

This zone showed relatively little change in waterfowl utilization between the two surveys. The most notable shift was the virtual elimination of use by Canada Goose in the spring plus a general decline in bay duck numbers, again most obviously in the spring. Sea duck use rose particularly in the spring when the birds concentrated along the ice front early in the season.

4.1.8 Prince Edward Point

This zone as in the earlier survey held major numbers of waterfowl mostly in the fall. Fall bay duck counts rose although proportionately less so than in some of the other Lake Ontario zones. Sea duck numbers showed increases in both seasons.

4.1.9 Wellington

The only major change occurring in this zone, was the widespread decline in the spring and rise in the fall of bay duck numbers (mostly scaup). In contrast to earlier surveys, however, scaup were mostly found in flocks offshore at the south end of the zone rather than in Weller's Bay; this may point to hunting activity moving the birds into open water.

4.1.10 Presqu'ile

An eight-fold increase in fall utilization by bay ducks was the only notable change. Large rafts were found at the east end of the zone; day-time use of Presqu'ile Bay itself appeared limited in the fall, probably a result of hunting pressure.

4.1.11 Belleville and Picton

The Quinte zones showed relatively minor changes in the spring use except for bay ducks which dropped in numbers; however, as the ice on the bay broke up later than during the earlier survey, availability of the zones to spring migrants was reduced. Fall use in both zones showed substantial increases in most categories, and in particular mergansers. It is suspected that the low level of waterfowl use noted in 1976 related to deteriorating habitat quality due to phosphorus pollution. Recent shifts in the fish community towards the larger species may well provide improved feeding opportunities for piscivorous waterfowl.

4.2 Management Implications

Overall use of the surveyed area by waterfowl remained at approximately the same level as that noted in the earlier survey although there have been substantial shifts in levels between the seasons and among zones. This is largely due to shifts in the distribution of bay ducks which form the dominant group. While some of this can be related to changes in hunting regulations and possibly in local habitat, much remains without obvious explanation. Further study is needed to determine if these shifts could result from broad but subtle changes in habitat or from weather conditions (passage of fronts) that affect movements of the birds and thus degree of utilization. Moreover, these changes do not seem to reflect population changes but may instead result from a more general re-distribution of the birds; note that, in contrast to eastern

Ontario, spring bay duck numbers in southwestern Ontario have risen (Dennis et al. 1984), while fall numbers have declined. Shifts in migration routes of bay ducks appear to happen quite frequently, often without obvious reason (see Serie et al. 1983).

Crucial to the above questions is a thorough understanding of offshore habitat, an initial assessment of which is presently underway (Bottomley 1987 and 1988). Also important is the examination of the connection between emergent shoreline marshes and offshore habitat important to diving ducks. This will allow development of management strategies to conserve and improve these habitats thus maximizing capacity of the area to support staging waterfowl.

5. Acknowledgements

I am very grateful to G. McKeating (GM) who participated as an observer on almost all flights in 1985. He also co-ordinated baseline studies of the Ontario St. Lawrence River through which program this section of the survey was funded. D. Fillman (DF) provided very capable assistance as the observer on most remaining flights. T. Kellar (TK) of the Ontario Ministry of Natural Resources also participated in four surveys for which he arranged funding as part of flyway Canada Goose and mid-winter waterfowl inventories; this was a major contribution to the work. I also wish to thank D. Welsh (DAW) who kindly took part in one flight, K. Adams and G. Ocquaye who entered the data into the computer and assisted in the analysis, and E. Bottomley and H. Lévèsque of our habitat section who provided much useful information about wetlands along the survey route. H. Boyd, D. Dennis, and G. Parker reviewed the manuscript and made helpful comments.

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